

aises and clearly points out the obvious difficulty that the resemblances in pattern are not to be explained by her hypothesis.

Similar bias is shown in the prominence given to unimportant and often partisan statements; while the original evidence on which an opposite conclusion has been based is neglected or barely alluded to.

Thus, referring to the variable coloration of caterpillars, we read on p. 147: "According to recent research, it is not so much the colour of the environment which directly affects the larvæ as the intensity of the light" (see Garbowski). To the conclusive experiments upon which an opposite contention is based no allusion is made, the bias of the writer permitting nothing more than a vague reference to "popular books besides those already mentioned." But, on the strength of the statement quoted above, we are treated with reflections upon the errors of a simple explanation in biology.

Again, on p. 325, in reference to the artificially produced variations in the colours of butterflies, we are told that "competent entomologists (e.g. Garbowski) are of opinion that the new colours have little or no phylogenetic importance," without the slightest indication that highly competent authorities have given very good reasons for an opposite conclusion. In fact, if the writer agrees with an authority, it is sufficient to quote his opinion without his reasons, and, above all, without any of the reasons which point in another direction.

The references to Piepers' easily answered and often superficial objections to the theory of mimicry (pp. 316-321) are given at considerable length, and the reader unacquainted with the subject might well suppose, from the writer's concluding remarks, that serious difficulties had been raised.

In a similar spirit the writer speaks of "the (by hypothesis) well-protected *Heliconidae*" (p. 149), thus assuming an assumption on the part of those who seek an interpretation based upon natural selection, and neglecting the considerable body of evidence, direct as well as indirect, which has been brought together.

The use of the contemptuous "so-called" occasionally recalls the jest about the "so-called nineteenth century."

The statement of the procedure of the Darwinian school (p. 306), in attempting to solve the problems of colour, is the merest travesty, quite unworthy of serious comment.

Apart from the obvious bias of the writer in dealing with natural selection, of which numerous other examples might have been adduced, the work is likely to be useful. The most interesting and valuable parts are those dealing with subjects which the authoress has herself investigated, such as the structural colours of birds' feathers. The book is, in fact, not a well-balanced and judicial account of the subject, "Colour in Nature," but an interesting exposition of those parts of her subject with which the authoress is in sympathy, other parts being either distorted or omitted. In the former category would doubtless be placed the interpretation of external colour, as the expression of internal structure, of which a single example is given on p. 226, and it is therefore remarkable that no reference is made to the numerous examples which the late Alfred Tylor was accustomed to explain in this manner.

The book is clearly printed, with few printer's errors, and the small number of simple illustrations sufficiently explain the writer's meaning. E. B. P.

THE GROWTH OF ANIMAL AND VEGETABLE ORGANISMS.

Experimental Morphology. By Charles Benedict Davenport, Ph.D., Instructor in Zoology in Harvard University. Part 2. Pp. xviii+281 to 508. (New York: Macmillan Company; London: Macmillan and Co., Ltd., 1899.)

THE second part of Dr. Davenport's work—the first part appeared two years ago and was noticed in NATURE, October 14, 1897—deals exclusively with the effect of chemical and physical agents upon the growth of animal and plant organisms. In the preface the author draws attention to the importance of the study of the conditions which affect growth. "The possibility of increasing the human race beyond limits that are not far off depends upon a better knowledge of the conditions of growth. The reader has only to consider that the world's supply of 2500 million bushels of wheat, 2000 million bushels of maize, 90 million tons of potatoes, and its untold millions of tons of beef, pork, and fish are reproduced each year by growth." This importance has recently been emphasised by the remarkable result of Sir William Crookes' researches into the statistics of the world's wheat supply as set forth in his presidential address at the Bristol meeting of the British Association, and the controversy to which that address has given rise. Dr. Davenport selects as his definition of growth "increase in volume," a definition which is by no means safe from criticism. Although we all think we understand what is meant when growth is spoken of, biologists have been by no means in agreement as to how exactly it should be defined. Thus, as the author points out, while Huxley spoke of growth as "increase in size," Sachs regards the volume increase as necessarily intimately associated with change of form, while Pfeffer takes the qualifying part of Sachs' definition, and defines growth as change in form only, and this is accepted by Vines, who adds: "accompanied usually by increase in bulk." To us this definition appears far more satisfactory, even if it is associated with the idea of development, than the more limited definition adopted by Davenport. In the animal organism especially is it difficult to exclude the idea of change of form in association with growth, nor does it seem reasonable to place a mere swelling due to imbibition of water or to distension with gas upon the same footing as a new formation of bioplasm.

The book before us is, however, almost entirely concerned with vegetable organisms, in which, no doubt, the imbibition of water plays a much more important part in the process of growth than it is apt to do in animals. And as a matter of fact the percentage of water in many animal embryos undergoes a steady decrease as development and growth proceed.

With regard to the effect of chemical agents upon growth, one of the most interesting parts of the work is that dealing with the supply of nitrogen to growing plants, whether it be offered to them in the form of a salt

(nitrate) added to the soil, or, as occurs in Leguminosæ, in the form of atmospheric nitrogen, fixed for their assimilation by the symbiotic bacteria at their roots.

Chemotropism, or the effect of chemical agents upon the direction of growth, and heliotropism (phototropism), or the effect of light upon the direction of growth, both receive their due share of attention. The effect of water upon growth is treated separately from that of other chemical agents, this amount of attention being accorded it on account of its immense importance—especially in plants—in the process. The effects of contact with solids and that of molar agents in general are duly considered, and the chapter devoted to them includes subjects so diverse as the results upon the growth of bacteria by violently shaking the vessel containing them, the tendency of twining stems and tendrils to grasp the solid objects with which they come in contact, the effect of wounds upon the growth of plants, and even the effect of flowing water in influencing the direction of growth. The effect of gravity upon the growth of sessile organisms (geotropism) and the results obtained by neutralising this effect by the employment of the klinostat is also considered, and illustrated by numerous diagrams. The effect of atmospheric electricity in increasing the rate of growth was supposed to be demonstrated by the experiments of Grandeau, who reared two similar plants—one in the open, and the other with an enclosure of wide-meshed wire netting—with a marked balance in favour of the one which was exposed freely to the influence of any electricity which might be present in the atmosphere; but others have obtained negative or discordant results.

The effect of heat in influencing the growth of organisms is familiar to every biologist, and Dr. Davenport illustrates it by numerous tables and charts taken from observations upon both plants and animals. It is indeed impossible here so much as to enumerate all the different aspects from which the subject of growth has been studied, and to which reference may be found; and although the book does not profess to be anything more than a compilation, and, in fact, contains no matter which is entirely original, it is that sort of compilation which will be of most use to the student of biology, as indicating to him where he may at once come across the work which has been done in each department of the subject of which it treats. That the information yielded should include everything upon so vast a subject is too much to expect in a book of less than five hundred by no means closely printed pages, and, in fact, one occasionally misses a reference to work of no little interest and importance, such as that of Ringer upon the influence of mineral salts upon the growth of tadpoles, and of Romanes upon the comparative effects of flash light and steady light in producing phototropism in seedling plants. Neither is the subject of the influence of drugs considered at anything like the length which its importance seems to deserve. Nevertheless, for the reasons indicated, and because the book is a painstaking and, on the whole, a successful attempt to furnish a connected account of an important branch of experimental morphology, it will be welcomed by the many workers who are devoting themselves to the pursuit of this interesting class of investigation.

A BOOK ON MOUNTAINS.

Die hochgebirge der Erde. Von Robert von Lendenfeld. Mit titelbild in Farbendruck 148 Abbildungen und 15 Karten. Pp. xiv + 532. (Freiburg im Breisgau: Herdersche Verlagshandlung, 1899.)

THIS is a most conscientious piece of bookmaking. The author appears to have read and made a summary of all the more important descriptions of the mountain masses of the globe. Beginning with a sketch of the physiography of mountains, their development and sculpturing, he passes on to describe them chain by chain. As he has himself travelled much, he can often speak from personal experience, while the numerous and generally excellent illustrations enable the reader to realise the different types of scenery. Reproductions of photographs are used in most cases, but occasionally, of course, copies of engravings, variable in quality, were alone available. Some, both of the one and the other, have done duty before, and a few perhaps may be more attractive to the general than to the scientific public. Pictures, for instance, of climbers in a mist seem more appropriate to a book of travels, and some of those representing mountain plants or animals are hardly such as to enhance the value of the book. Attractive also as are all Mr. E. T. Compton's sketches, we cannot but feel that in a treatise of this kind reproductions of photographs would have been better, for accurate delineation is sometimes sacrificed to artistic sensibility. This is especially true of the drawing of the Grivola on p. 128, in which we have not found it easy to make out the topography. These, however, are matters of opinion. The book contains a vast mass of information, brought down to the latest possible date, and collected with a thoroughness and accuracy truly German.

The book also exhibits one or two defects, which perhaps, like its merits, are related to its birth-place. In the treatment of the subject we are conscious of some want of lucid arrangement and of a comprehensive grasp. In regard to the former, a brief outline of the contents may perhaps best indicate our meaning. It begins with a short sketch of mountain building and sculpturing, followed by a glance at the characteristic flora and fauna: a subject so wide that any details can only be fragmentary, and we should have preferred to pass it by in a few paragraphs which stated the general principles by which the life distribution has been determined. The author then commences, at the seventieth page, his special descriptions with the mountains west of the Mediterranean, from the Atlas to the Pyrenees. Thence he passes on to the Alps, which are treated, perhaps not unjustifiably, at rather disproportionate length, and then in another section we jump from Sardinia and Corsica to the Apennines, run along the Carpathians to the Balkans, make a leap to the Caucasus, and finally land with the ark on Ararat. Next comes the radiating group of giant chains in Central Asia, of which some of the less known are very well described. In the next section, after a very brief glance at the northern mountains of Eurasia in general, we are transported to Spitsbergen and Iceland, and then restored to the mainland in Scandinavia and the Urals. After that we wander to Central and Southern Africa,